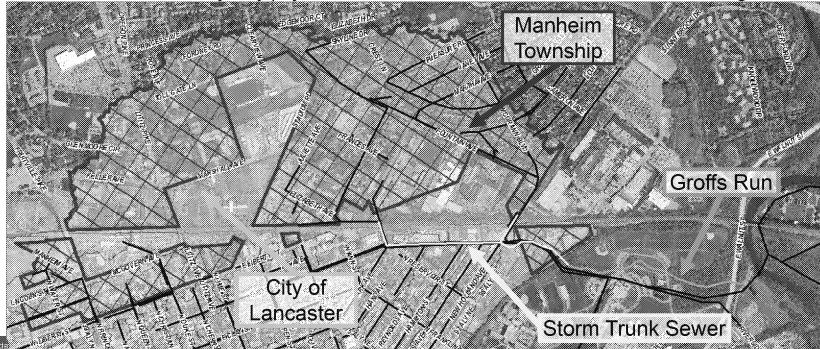
### Manheim Township Flow Removal Alternative Overview

- Storm Separation
  - Estimated capital cost: \$13.3 M, based on design for 5-year event
  - Component benefit; cost sharing
- Groffs Run Restoration (~2,800 ft)
  - Estimated conceptual restoration capital cost: \$5.3 M
  - Disconnection Analysis for City Combined Area (e.g., like Northwest Linear)
- Total estimated conceptual capital cost: \$18.6 M

Recommended that City only pay incremental cost to accommodate its flow in the design.



Estimated Overflow Reduction: 51 MG

## Manheim Township Flow Removal Storm Separation

- Estimated Conceptual Capital Cost: \$13.3 M, includes:
  - New storm trunk sewers, sized based on 5-year design event
  - New storm pipes to run parallel to existing combined pipes (see conceptual locations in images to right)
    - Increased length by 20% for 12" pipes, 10% for 18" pipes and 5% for 24" pipes to be conservative
  - Connections to new/existing inlets
    - Increased estimated number by 25% for City & Manheim Twp alternative
    - Increased estimated number by 15% for Manheim Twp only alternative
  - Assumed half of the existing inlets would need to be replaced
  - Pipe depth assumed by 5' of cover of new pipe
  - New manholes every 300 ft
  - New junction box at New Holland Ave & Ross St (new trunk sewer intersection)
  - Dewatering, maintenance of flow, and traffic maintenance
  - Capital cost multipliers:

Multipliers Description	Multiplier
Administration Costs-Design, Legal Fees, & Construction	4%
Project Contingencies	25%
Interest (for 1 year of construction only assumed)	1%
Miscellaneous - PTI, test bore, ECI Inspector, R/W	4%
Field Engineering & Inspection	5%
Design & Eng. Services	10%
Program Management	1%
Planning & Prefiminary Design	2%
Performance Bond	1%
Total Multipliers =	53%

### Legend

---- Groffs Run

— City Sewer Lines

Storm Separation Pipe

12" diam.

∞∞18" - 24" diam.

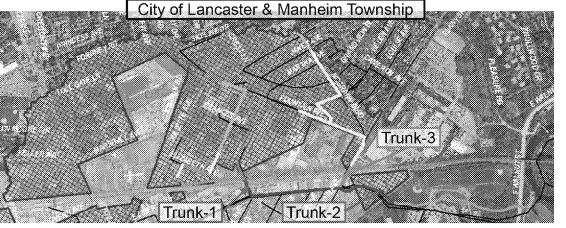
30" - 36" diam.

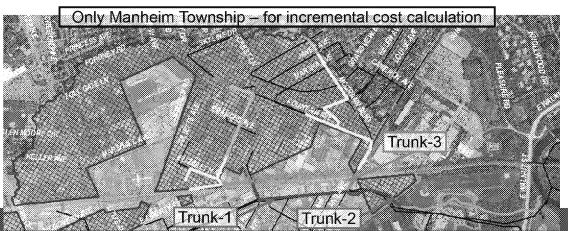
48" - 60" diam.

84" - 96" diam.

CSS within Manheim Township separated to Groffs Run

CSS within City of Lancaster separated to Groffs Run





# Manheim Township Flow Removal Storm Separation – PACC tool

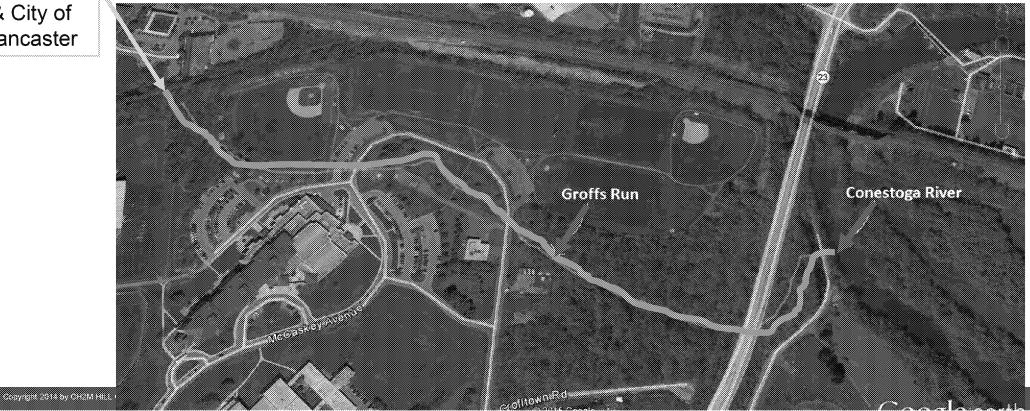
						City o	f Lanca	ster & N	lanheim	Townsh	nip								T	_		
Segment ID	*Pipe Size (in)	Length of Pipe in Street (ft)	Length of Pipe out of Street (ft)	**Average Bepth (ft)	# of inlet connects	# of Aband'd iniets	# of New Inlets	# of Water Services Replaced	Street Width (f1)	# of Manholes	# of Junction Boxes	# of Existing MH Surface Rehabs	Small Medium or Large Creek Crossing (S,M, or L)	Sanitary Sewer Construction		Dewatering Required		Brownfields				Total Cost Per Segment
Trunk-1	84	1912	8	12	0	Q.	٥	0	12	7	1	0		N	N	¥			N			\$ 2,531,786
Trunk-2	96	1096	8	13	0	0	0	0	13	4	1	0		N	Ħ	X			N			\$ 1,828,518
Trunk-3	80	434	0	10	Q	Ü	0	0	10	2	0	0		N	N	Y	Y		N			\$ 327,207
12° pipes	12	698	0	S	0	Ü	0	0	8	3	0	0		N	N	Y	Y	N	N	Y	N :	\$ 173,453
18" pipes	18	508	0	8.5	0	0	0	0	8	2	0	0		N	N	¥	¥	N	N	<u> </u>	N	\$ 138,927
24" pipes	24	1603	0	7	0	0	0	0	8	6	0	0		N	PE I	Ÿ	<del>}</del>	N	N		N	\$ 487,676
30° pipes	30 36	3142 1337	0	7.5 8	0	0	0	0	8 8	11	8	0		N	88	븴	<del>\                                    </del>	N N	RI .			\$ 1,122,973 \$ 578,557
38° pipes 48° pipes	43	1070	0	9	0	0	0	0	9	5 4	ម បី	0		N N	N.	Ÿ	<del>*</del>		N N		N I	\$ 525,438
50° pipes	63	543	0	10	0	0	0	8	10	2	0	0		N	N N	3						<u>\$ 920,430</u> \$ 483,909
Inlet Connect	0.0	0	Ü	ů.	83	0	0	0	8	0	0	0		N	N	¥						\$ 313.740
New inlets	0	0	0	0	0	G C	42	0	Ö	0	ű	ő			N	Ý						\$ 190.512
		<del></del>								I	- 2	, v		+	***			**		<u></u> -	100	\$ 100,01L
					Only Ma					ntal cos								14		T		
Segment IB	*Pipe Size (in)	Length of Pipe in Street (ft)	Length of Pipe out of Street (ft)	**Average	Only Ma  # of inlet connects					ental cos			Small Medium or Large Creek Crossing (S,M, or L)	Sanitary Sewer Construction			of Flow	sp:		ce Required	ban Alignment	Total Cost Per Segment
Trunk-1	Size (in) 72	of Pipe in Street (ft)	of Pipe out of Street (ft)	**Average Depth (ft)	# of inlet connects	# of Aband'd inlets	Townsh  # of New Interts	# of Water Services Replaced	Street Width (ft)	# of Manholes	# of Junction Boxes	# of Existing MH Surface Rehabs	Medium or Large Creek Crossing	# Sanitary Sewer Construction	≈ In Rock	< Dewatering Required	< Maintenance of Flow	≈ Brownfields	≈ Clearing and Grubbing	Traffic Maintenance Required	≈ Urban Alignment	Total Cost Per Segment \$ 1,975,978
Trunk-1 Trunk-2	72 84	of Pipe in Street (ft) 1912 1096	of Pipe out of Street (ft)	**Average Depth (ft) 11 12	# of inlet connects	# of Aband'd inlets	# of New Intets	# of Water Services Replaced 0	Street Width (ft)	# of Manholes	# of Junction Boxes	# of Existing MH Surface Rehabs	Medium or Large Creek Crossing	# # Sanitary Sewer Construction	zz zu In Rock	< < Dewatering Required	< walkening of Flow	z z Brownfields	= Clearing and Grubbing	Traffic Maintenance Required	== Urban Alignment	Total Cost Per Segment 3 1,975,978 3 1,532,012
Trunk-1 Trunk-2 Trunk-3	Size (in) 72 84 48	of Pipe in Street (ft) 1912 1096 434	of Pipe out of Street (ft) 0 0	**Average Bepth (ft) 11 12 8	# of inlet connects 0 0	# of Aband'd Inlets	# of New Intets	# of Water Services Replaced 0 0	Street Width (ft)	# of Manholes	# of Junction Boxes	# of Existing MH Surface Rehabs 0	Medium or Large Creek Crossing	= = Sanitary Sewer Construction	in Rock	K K K Dewatering Required		z z z Brownfields	≈ Clearing and Grubbing	Traffic Maintenance Required	==== Urban Alignment	Total Cost Per Segment 3 1,975,978 3 1,532,012 3 257,312
Trunk-1 Trunk-2 Trunk-3 12" pipes	72 84 48 12	of Pipe in Street (ft) 1912 1096 434 899	of Pipe out of Street (ft) 0 0	**Average Depth (ft) 11 12 3 6	# of inlet connects  © © © ©	# of Aband'd Inlets	# of New Inlets	# of Water Services Replaced 0 0 0	Street Width (ft)	# of Manholes	# of Junction Boxes	# of Existing MH Surface Rehabs 0 0	Medium or Large Creek Crossing	# # # Sanitary Sewer Construction	z z z z hr Rock	< < Dewatering Required	A A A A Maintenance of Flow	zzzzz Browmfields	### Cleaning and Grubbing	A A A Traffic Maintenance Required	Z Z Z Urban Alignment	Total Cost Per Segment 3 1,975,978 3 1,532,012 3 257,312 5 173,453
Trunk-1 Trunk-2 Trunk-3 12" pipes 18" pipes	Size (in) 72 84 48 12 18	of Pipe in Street (ft) 1912 1096 434 689 508	of Pipe out of Street (ft) 0 0 0 0	**Average Depth (ft) 11 12 8 8 8	# of inlet connects	# of Aband'd Inlets	# of New Intets	# of Water Services Replaced 0 0 0	Street Width (ft) 11 12 9 8	# of Manholes	# of Junction Boxes	# of Existing MH Surface Rehabs	Medium or Large Creek Crossing	z z z z Sanitary Sewer Construction	z z z z z z z z z z z z z z z z z z z	K K K Dewatering Required	A A A A Maintenance of Flow	zzzzz Browmfields	= Clearing and Grubbing	A A A Traffic Maintenance Required	ZZZZZUDan Alignment	Total Cost Per Segment 3 1,975,978 3 1,532,012 3 257,312 3 173,453 5 138,827
Trunk-1 Trunk-2 Trunk-3 12" pipes 18" pipes 24" pipes	Size (in) 72 84 48 12 18 24	of Pipe in Street (ft) 1912 1096 434 699 503 1603	of Pipe out of Street (ft)  0 0 0 0 0	**Average Bepth (ft) 11 12 8 8 6.5 7	# of inlet connects	# of Aband'd Inlets	# of New Inlets	# of Water Services Replaced 0 0 0	Street Width (ft) 11 12 9 8 8 8	# of Manholes	# of Junction Bloxes	# of Existing MH Surface Rehabs	Medium or Large Creek Crossing	z z z z z Sanitary Sewer Construction	zzzzz In Rock	K K K Dewatering Required	A A A A Maintenance of Flow	Z Z Z Z Z Brownfields	### Cleaning and Grubbing	A A A A Traffic Maintenance Required	ZZZZZUNDan Alignment	Total Cost Per Segment 3 1,975,978 3 1,532,012 3 257,312 3 173,453 5 138,827 \$ 487,876
Trunk-1 Trunk-2 Trunk-3 12" pipes 16" pipes 24" pipes 36" pipes	72 84 48 12 18 24 30	of Pipe in Street (ft) 1912 1096 434 899 503 1603 3372	of Pipe out of Street (ft)  0 0 0 0 0 0 0	**Average Bepth (ft) 11 12 8 8 6.5 7	# of inlet connects  0 0 0 0 0 0 0 0 0 0 0	# of Aband'd Inlets	# of New inlets	# of Water Services Replaced 0 0 0	Street Width (ft) 11 12 9 8 8 8 8	# of Manholes	# of Junction Boxes	# of Existing MH Surface Rehabs	Medium or Large Creek Crossing	z z z z z z Sanitary Sewer Construction	H Rock	K K K Dewatering Required	XXXXX Maintenance of Flow	ZZZZZZZ Brownfields	### Cleaning and Grubbing	X X X X X Traffic Maintenance Required	zzzzzzzu Wrban Alignment	Total Cost Per Segment 3 1,975,978 3 1,532,812 3 257,312 3 173,453 5 138,857 5 487,876 5 1,208,289
Trunk-1 Trunk-2 Trunk-3 12" pipes 16" pipes 24" pipes 36" pipes 36" pipes	72 84 48 12 18 24 30 36	of Pipe in Street (ft) 1912 1996 434 899 503 1603 3372 1071	of Pipe out of Street (ft)  0 0 0 0 0 0 0 0	**Average Bepth (ft) 11 12 9 6 5 7 7.5	# of inlet connects  0 0 0 0 0 0 0 0 0 0 0	# of Aband'd Inlets 0 0 0 0 0	# of New Inlets	# of Water Services Replaced 0 0 0	Street Width (ft) 11 12 9 8 8 8 8	# of Manholes	# of Junction Boxes	# of Existing MH Surface Rehabs	Medium or Large Creek Crossing	ZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZ	z z z z z z z z z z z z z z z z z z z	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	A A A A A A A Maintenance of Flow	ZZZZZZZZBrownfields	zzzzzzzzz Clearing and Grubbing	A A A A Traffic Maintenance Required	zzzzzzzu Urban Alignment	Total Cost Per Segment 3 1,975,978 3 1,532,012 \$ 257,312 \$ 173,453 \$ 138,927 \$ 487,878 \$ 1,208,289 \$ 481,819
Trunk-1 Trunk-2 Trunk-3 12" pipes 18" pipes 24" pipes 30" pipes 38" pipes 38" pipes 33" pipes	72 84 48 12 18 24 30 36 33	of Pipe in Street (ft) 1912 1096 434 899 503 1603 3372 1071 1106	of Pipe out of Street (ft)  0 0 0 0 0 0 0 0 0 0 0	**Average Bepth (ft) 11 12 8 8 6.5 7 7.5 8 7.75	# of inlet connects  0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	# of Aband'd inlets 0 0 0 0 0 0	# of New Inlets	# of Water Services Replaced 0 0 0 0 0	Street Width (ft) 11 12 9 8 8 8 8	# of Manholes 7 4 2 3 2 8 12 4	# of Junction Boxes	# of Existing MH Surface Rehabs 0 0 0 0	Medium or Large Creek Crossing	# # # # # # # Sanitary Sewer Construction	n n n n n n n n n n n n n n n n	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	A A A A A A A A Maintenance of Flow	zzzzzzzzzzzzzzzzz	### ### Cleaning and Grubbing	A A A A A Traffic Maintenance Required		Total Cost Per Segment \$ 1,975,978 \$ 1,532,012 \$ 257,312 \$ 173,453 \$ 138,927 \$ 487,818 \$ 440,595
Trunk-1 Trunk-2 Trunk-3 12" pipes 18" pipes 24" pipes 30" pipes 36" pipes 33" pipes 60" pipes	72 84 48 12 18 24 30 36 33 60	of Pipe in Street (ft) 1912 1096 434 699 503 1603 3372 1071 1106 543	of Pipe out of Street (ft)  0 0 0 0 0 0 0 0 0 0 0 0 0 0	**Average Bepth (ft) 11 12 9 8 6.5 7 7.5 8 7.75 10	# of inlet connects  © © © © © © © © © © © © © © © © © ©	# of Aband'd Inlets 0 0 0 0 0 0 0 0	# of New Intets  0 0 0 0 0 0 0 0	# of Water Services Replaced 0 0 0 0	Street Width (ft) 11 12 9 8 8 8 8 8	# of Manholes 7 4 2 3 2 3 2 4 4 4 4 4	# of Junction Boxes 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	# of Existing MH Surface Rehabs 0 0 0 0 0	Medium or Large Creek Crossing	H H H H H H Sanitary Sewer Construction	A H H H H H H H H H H H H H H H H H H H	A A A A A A Dewatering Required	A A A A A A Maintenance of Flow	ZZZZZZZZBrownfields	### ### ### ### ### Gleaning and Grubbing	A A A A A A A Traffic Maintenance Required	E E E E E E E Urban Alignment	Total Cost Per Segment 3 1,975,978 3 1,532,012 \$ 257,312 \$ 173,453 \$ 138,927 \$ 487,878 \$ 1,208,289 \$ 481,595 \$ 430,595 \$ 403,909
Trunk-1 Trunk-2 Trunk-3 12" pipes 18" pipes 24" pipes 30" pipes 38" pipes 38" pipes 33" pipes	72 84 48 12 18 24 30 36 33	of Pipe in Street (ft) 1912 1096 434 899 503 1603 3372 1071 1106	of Pipe out of Street (ft)  0 0 0 0 0 0 0 0 0 0 0	**Average Bepth (ft) 11 12 8 8 6.5 7 7.5 8 7.75	# of inlet connects  0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	# of Aband'd inlets 0 0 0 0 0 0	# of New Inlets	# of Water Services Replaced 0 0 0 0 0	Street Width (ft) 11 12 9 8 8 8 8	# of Manholes 7 4 2 3 2 8 12 4	# of Junction Boxes	# of Existing MH Surface Rehabs 0 0 0 0	Medium or Large Creek Crossing	n n n n n n n n n n n n n n n n n n n	A A A A A A A A A A IN Rock	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	A A A A A A A A A Maintenance of Flow	RESERVE RESERVE Brownfields	ZZZZZZZ Clearing and Grubbing	A A A A A A A A Traffic Maintenance Required	z z z z z z z z Urban Alignment	Total Cost Per Segment \$ 1,975,978 \$ 1,532,012 \$ 257,312 \$ 173,453 \$ 138,927 \$ 487,818 \$ 440,595

### Manheim Township Flow Removal Groffs Run Restoration

Storm inflows from Manheim Twp & City of

Lancaster

- Conceptual Restoration Capital Cost: \$5.3 M
  - Estimate based on other projects of similar length and contributing area
    - ~\$1,900/ft for magnitude of contributing area and flow
  - Consider hydrology:
    - Perennial water to function like stream, instead of a ditch to convey stormwater
    - Enough inflows to provide baseflow? (e.g., McCaskey)



### Manheim Township Flow Removal Estimated Cost Summary

		•	Life Cycle Cost (\$)				
Pro	ject	Total Cost (\$)	City Cost (\$)	External Cost (\$)	Total Cost (\$)	City Cost (\$)	External Cost (\$)
Bas	seline						
Ma	nheim Township Separation <sup>2</sup>	\$18,596,000	\$2,546,000	\$16,050,000		\$2,718,000	\$17,704,000
Ma	nheim Township Separation <sup>2</sup> Separate Storm to Groffs Run	\$18,596,000 \$13,345,000	<b>\$2,546,000</b> \$1,827,000	<b>\$16,050,000</b> \$11,518,000		<b>\$2,718,000</b> \$1,827,000	<b>\$17,704,000</b> \$11,900,000

#### Notes

- 2 It is recommended that City of Lancaster pays only the incremental cost to increase size of sewer and stream to accommodate City flow
- 3 Conceptual cost variable based on site conditions and level of restoration